

ANNEX J

NUCLEAR POWER PLANTS (FIXED NUCLEAR FACILITIES)

I. TYPE OF HAZARD

Nuclear Power Plants (Fixed Nuclear Facilities)

II. DESCRIPTION OF HAZARD

There are presently four fixed nuclear facilities or reactors that under extreme circumstances and conditions could pose a threat to citizens of Missouri. These four reactors fall into two categories: research reactors and commercial nuclear power reactors. The first category, research reactors, represent a hazard only to personnel or others on site at the facility. Therefore, these reactors are not included in state radiological plans involving off-site emergency preparedness. For the second category, commercial nuclear power reactors, a worst-case scenario involving a significant release of radioactive material could force the evacuation of the general population within a 10-mile radius of the facility. A release of this magnitude could also contaminate food and water sources within a 50-mile radius.

The magnitude of releases from nuclear plant sites vary depending on the nature of the accident type, reactor design, and meteorological conditions during the release. The Nuclear Regulatory Commission (NRC) and Federal Emergency Management Agency (FEMA) have developed regulatory guidance that both the state and utility must meet to protect the health and safety of the general population within the 10-mile Emergency Planning Zone (EPZ). Four classes of Emergency Action Levels are used for early notification of incidents, with clear instructions for emergency organizations within the EPZ. The four emergency classifications listed in progression of severity are notification of unusual event, alert, site area emergency, and general emergency. These levels are discussed below.

A. Notification of Unusual Event

This classification describes unusual events that are in process or have occurred and indicates a potential degradation of the safety level of the plant. No releases of radioactive material requiring off-site response or monitoring are expected unless safety systems are further degraded.

B. Alert

This classification describes unusual events that are in process or have occurred and indicate a potential degradation of the level of plant safety. Any releases are expected to be limited to small fractions of the Environmental Protection Agency (EPA) Protective Action Guideline (PAG) exposure levels.

C. Site Area Emergency

This classification level describes events in process or having occurred that involve actual or likely major failures of the plant functions needed to protect the public. No releases are expected to exceed EPA PAG exposure levels except near the site boundary.

D. General Emergency

This classification describes an event in process or having occurred that involves actual or imminent substantial core degradation or melting, with the potential for loss of containment integrity. Releases can reasonably be expected to exceed the EPA PAG exposure levels off-site for more than the immediate site area.

III. HISTORICAL STATISTICS

A. Research Reactors

Two research reactors are located in the State of Missouri: the University of Missouri-Rolla Reactor (UMRR) and the University of Missouri Research Reactor (MURR). The maximum hypothetical accident from either research reactor would place at risk only personnel working at the facilities or the public within the site boundary of the respective facilities. Both research reactors have emergency plans approved by the Nuclear Regulatory Commission (NRC) that conform with regulatory requirements in 10 CFR 50, Appendix E, and follow the guidance provided by Revision I to NRC Regulatory Guide 2.6, Emergency Planning for Research and Test Reactors, March 1982, and ANSI/ANS-15.16, Emergency Planning for Research and Test Research Reactors, November 29, 1981.

B. UMRR

UMRR is a water-moderated pool-type reactor licensed to operate at 200 KW. The UMRR is used for training and research purposes. Because the reactor is mainly used for training, it is not operated for long periods of time. The reactor is located on the east side of the Rolla campus near 14th Street and Pine Street in Rolla, Missouri. Due to the low power of licensing (200 KW), prevailing standards and guidelines do not require the establishment of an emergency planning zone. Therefore, no classification higher than a Site Area Emergency has been included in the UMRR emergency plans. The UMRR has been in operation since December 1961 and has never had an incident that would be considered an emergency action level.

C. MURR

MURR is a 10 MW pressurized water-moderated pool-type reactor with a containment building. The MURR is used to provide research, training, and services to the four campuses of the University of Missouri system, other universities, government agencies, and private industry as well. The reactor is located on a 550-acre tract of land south of the University of Missouri-Columbia campus on Providence Road. The MURR has an emergency planning zone encompassing the area within a 100-meter radius from the exhaust stack. No credible potential accidents have been identified for the MURR facility that would result in exceeding the classification of Notification of Unusual Events. As a result, no classification higher than a Site Area Emergency is included in the emergency plan for the MURR. The MURR has been in operation since October 1967. The reactor averages 8,060 hours of operation per year (155 hours per week) at peak flux due to the service work that it performs. During its history of operation, the MURR has never had an incident that would be considered an emergency action level.

D. Commercial Nuclear Power Reactors

Two commercial nuclear power reactors could have an impact on the health and safety of Missouri citizens. These reactors are the Callaway Nuclear Plant and the Cooper Nuclear Station, both of which are used for electrical power generation. Both utilities have emergency plans that conform to NUREG-0654, FEMA-REP-1 Rev.1, Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants. The utilities and the state are required to demonstrate annually various elements of preparedness through radiological emergency drills evaluated by inspectors representing the Federal Emergency Management Agency (FEMA) and the NRC.

E. Callaway Nuclear Plant

The Callaway Plant consists of one unit with a pressurized water reactor capable of providing 1150 megawatts of electricity. The plant is located in Callaway County, Missouri, and is owned and operated by Ameren UE, St. Louis. It is located 10 miles southwest of Fulton, 25 miles northeast of Jefferson City, 5 miles north of the Missouri River, and 80 miles west of St. Louis. The population within the 2.5-mile radius of the plant is low (approximately 30 residents). Approximately 4,500 people reside within a 10-mile radius of the plant. The plume exposure pathway has been expanded beyond the 10-mile radius to include the City of Fulton (population 10,000). Thus, the population within the plume exposure pathway is approximately 16,000. The plant site consists of 7,200 acres of land at the site, 6,800 of which are administered by the Missouri Department of Conservation as the Reform Conservation Area. Under this program, part of the area continues to be farmed, with income from farming providing funds for wildlife management and public recreation activities. Land within a 5-mile radius of the plant site is rural, consisting of 60 percent forest, 20 percent farm/crop land, and 20 percent pasture.

F. Cooper Nuclear Station

The Cooper Nuclear Station is a direct-cycle boiling water-type reactor with a net electrical generating capacity of 800,000 kilowatts. The facility is owned by the Nebraska Public Power District of Columbus, Nebraska. The plant is located on the Nebraska side of the Missouri River in Brownville, Nebraska, approximately 7 miles southwest of Rock Port, Missouri. The emergency planning zone within the Missouri side of the river is predominantly rural land, except for the towns of Rock Port, population 1,511, Phelps City, population 39, Langdon, population 32, and Watson, population 117. Atchison County is primarily affected by the emergency planning zone and is intersected by several major highways, including Interstate 29, U.S. Highway 136, U.S. Highway 275, and Missouri Highway 111. The total population at risk from a radiological incident in Atchison County is as follows: within 2 miles, approximately 15 people; within 5 miles, approximately 246 people; and within 10 miles, approximately 2,660 people.

IV. MEASURE OF PROBABILITY AND SEVERITY

The consequences of a radiological incident originating from one of the commercial nuclear power plants affecting the state can range in severity from insignificant to a high degree of radioactive contamination within the a 2- to 10-mile radius surrounding the facility. The most crucial concerns during a severe incident are safe evacuation and controlled access to the areas affected by a release of radioactive materials. In the aftermath, the main concerns are as follows: the extent of property needing to be decontaminated, contaminated food sources, and the time required to reach acceptable exposure rates and to allow the safe reentry of the public. Historically, due to their safe operation records, fixed nuclear

facilities have not represented a high risk to the state. The Reactor Safety Study conducted by the NRC rated the chances of a major nuclear disaster as very low (a probability of one in one million per plant operating year). The report concluded that the worst accident type that could affect a nuclear power plant would be one resulting in a meltdown, which could be expected to occur once in 20,000 years of reactor operation. The report also stated that a meltdown would likely cause less than one fatality or injury. This low hazard rating is due to all of the added safety engineered instrumentation used to monitor and shut down nuclear plant systems before any severe damage occurs.

V. IMPACT OF THE HAZARD

An incident at a nuclear power plant resulting in a General Emergency and evacuation (one where a release from the site boundary would be expected) could have a dramatic psychological impact on the uninformed population within the evacuation zone. The utilities and the State of Missouri have an active Radiological Emergency Preparedness program to prepare local jurisdictions and the general population surrounding the plant for responding to such an incident. This program includes in-depth training of resources both from the state and local jurisdictions, and regularly scheduled drills and exercises evaluated by the Federal Emergency Management Agency. Extensive planning has focused on implementation of the emergency response plan for both the state and local jurisdictions. Emphasis is placed on prompt notification of emergency organizations and the public; evacuation routes; reception and care centers for evacuees; monitoring for radiological contamination; emergency worker preparedness; and public information in the form of brochures distributed to residents within the emergency preparedness zone. These programs are essential to the protection of the general public.

VI. SYNOPSIS

Nuclear reactors have been designed to survive natural disasters such as tornadoes and earthquakes without damage to critical systems. Considerable emphasis is placed on multiple-level governmental reviews of the design, construction, and operation of each nuclear power plant. These safety reviews begin prior to construction and continue throughout the operating life of the plant. Radiological planning and preparedness programs monitored by state and federal agencies are in place to ensure that emphasis is placed on the safety of the general public within the emergency planning zone. In addition, the historical record for nuclear power plants gives no indication that a serious accident involving a nuclear power plant will occur.

VII. MAPS OR OTHER ATTACHMENTS

The following figures are attached to this annex:

- Emergency Planning Zone for Callaway Nuclear Power Plant, Figure J-1
- Emergency Planning Zone for Cooper Nuclear Station, Figure J-2
- Emergency Planning Zone for MURR, Figure J-3.

FIGURE J-1

EMERGENCY PLANNING ZONE FOR CALLAWAY NUCLEAR POWER PLANT

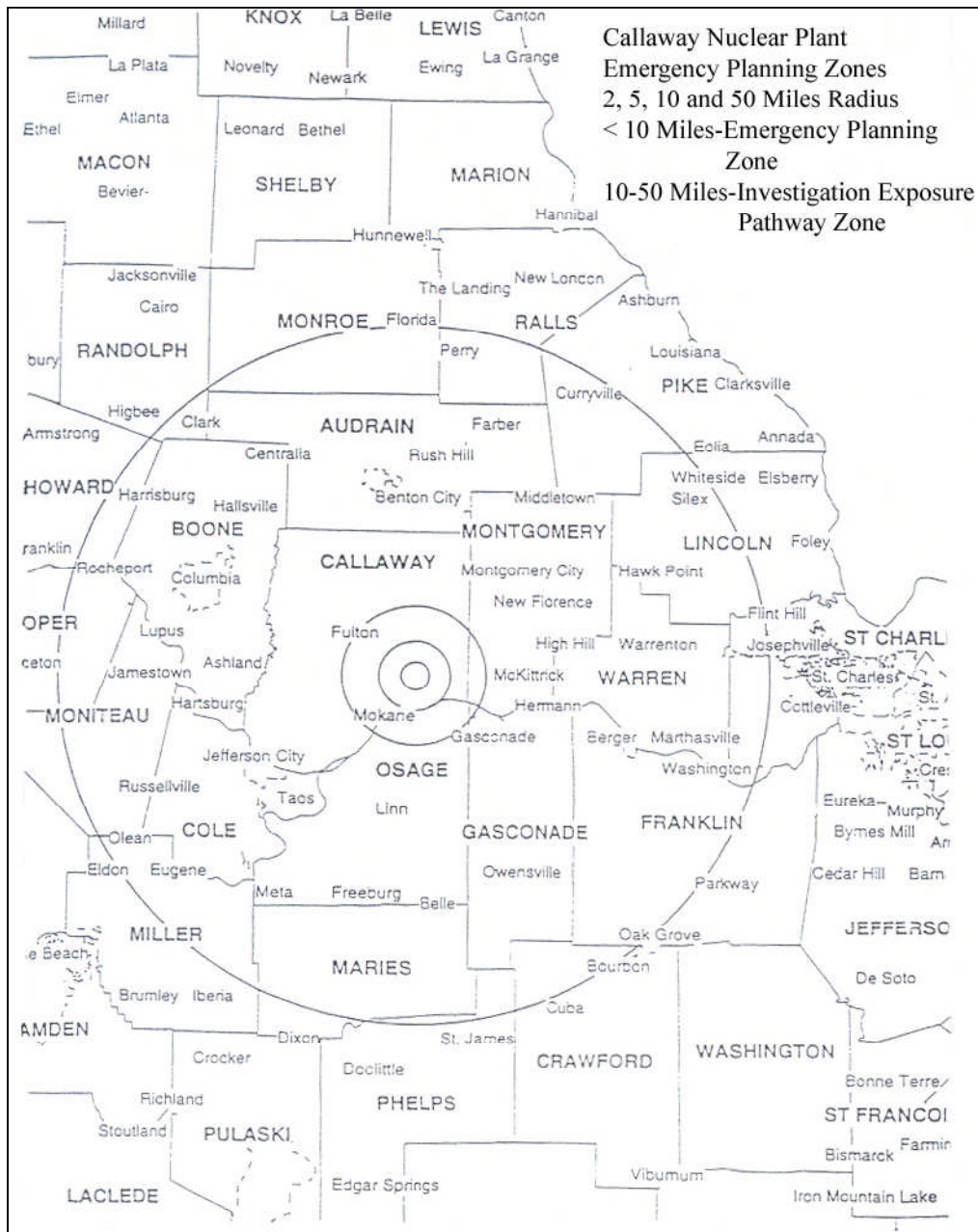


FIGURE J-2

EMERGENCY PLANNING ZONE FOR COOPER NUCLEAR STATION

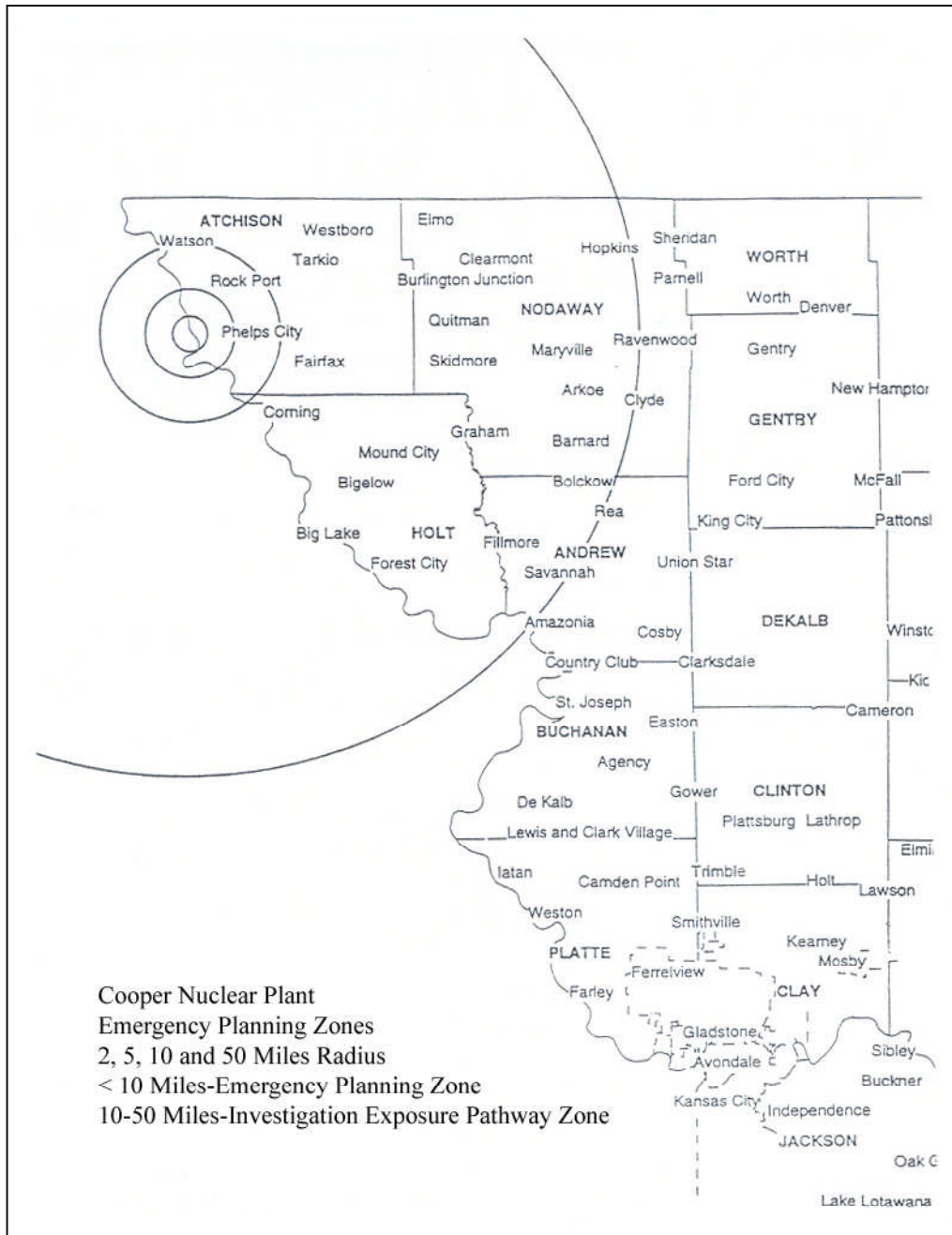
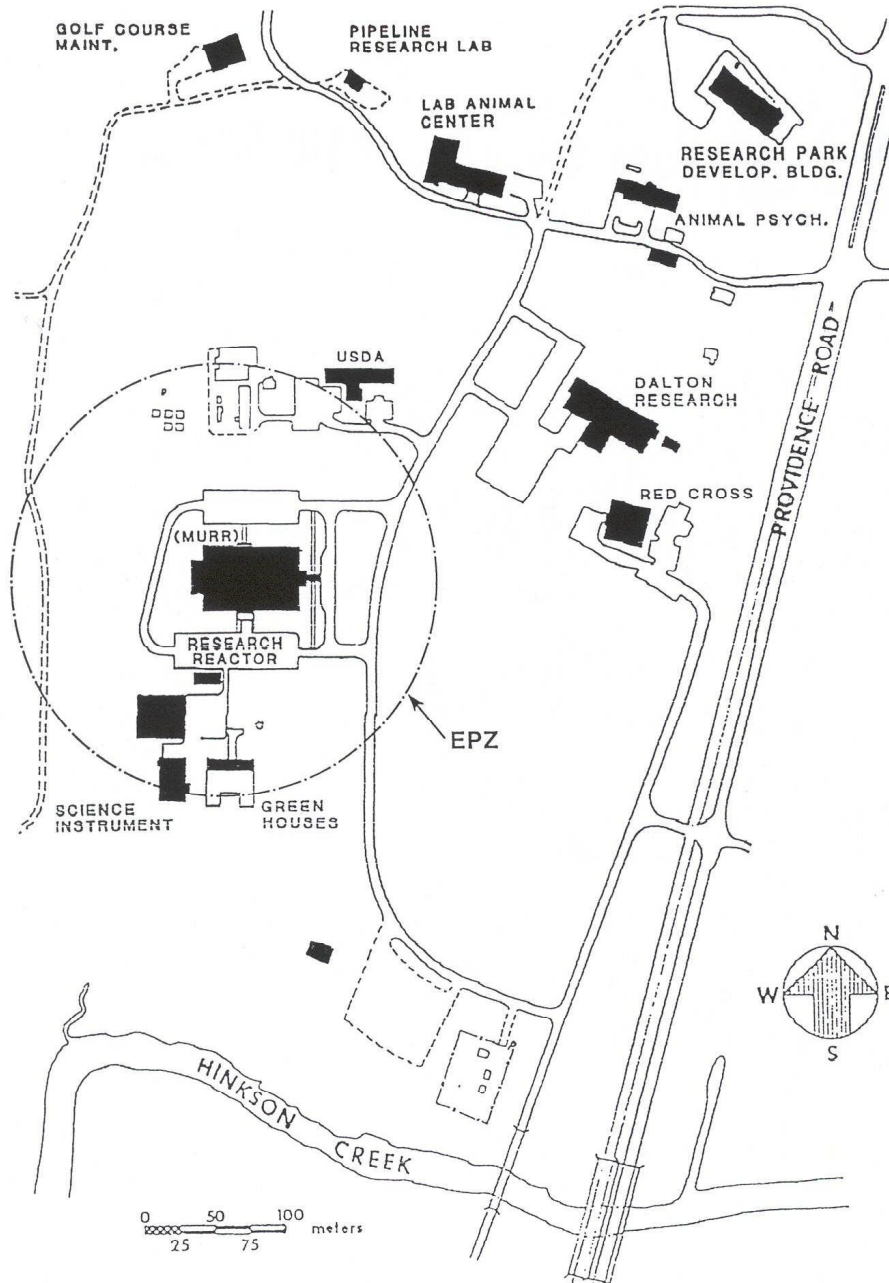


FIGURE J-3

EMERGENCY PLANNING ZONE FOR MURR



Rev. 12/20/95

VIII. BIBLIOGRAPHY

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